have not yet obtained this body in sufficient quantity, as it is only very slowly formed. I hope, however, to find a method to produce it in larger quantities, and also to obtain characteristic oxidation-products of the different hydrocarbons.

VII. "Researches into the Chemical Constitution of Narcotine and of its Products of Decomposition."—Part II. By A. MATTHIESSEN, F.R.S., and G. C. FOSTER, B.A. Received May 23, 1867.

(Abstract.)

In this memoir the following reactions have been studied:—

1. *The Action of Hydrochloric and Hydriodic Acids on Opianic Acid.*

When strong hydrochloric or hydriodic acid acts at 100° for some time on opianic acid, iodide or chloride of methyl is evolved and a new acid formed,

$$C_{10}H_{10}O_5 + HCl = C_9H_8O_5 + CH_3Cl.$$

We propose to call this acid methyl nor-opianic acid, as it stands intermediate between opianic acid and the normal opianic acid:—

Normal opianic acid	$C_8H_6O_5$
Methyl nor-opianic acid	$C_9H_8O_5$
Opianic acid or dimethyl nor-opianic acid	$C_{10}H_{10}O_5$

The new acid is soluble in cold water, but much more so in hot, from which it crystallizes on cooling with $2\frac{1}{2}$ molecules of water. Like hypogallic acid it strikes a dark blue with sesquichloride of iron; but on addition of ammonia in excess, a light-red solution is produced, differing, therefore, from the hypogallic-acid blue, with which ammonia becomes blood-red. From the analysis of the silver-salt it appears that methyl nor-opianic acid is monobasic.

2. *The Action of Hydrochloric and Hydriodic Acids on Meconin.*

When meconin is heated with strong hydrochloric or hydriodic acids at 100° for some time, it is split up into chloride or iodide of methyl and an acid of the composition $C_9H_8O_4$. The reaction is

$$C_{10}H_{10}O_4 + HCl = C_9H_8O_4 + CH_3Cl.$$

This new acid we may call *methyl nor-meconic acid*, as it stands between meconin and normal meconin:—

Meconin	$C_{10}H_{10}O_4$
Methyl nor-meconin or methyl nor-meconic acid	$C_9H_8O_4$
Normal meconin	$C_8H_6O_4$

Methyl nor-meconic acid is soluble in cold, but much more so in hot water; it is easily soluble in alcohol, and slightly so in ether. It reduces solutions of silver-salts in the cold, and behaves with sesquichloride of iron exactly like methyl nor-opianic acid. From the analysis of the barium-salt, methyl nor-meconic acid is monobasic.

3. *The Action of Hydrochloric and Hydriodic Acids on Hemipinic Acid.*

The action of hydriodic acid on hemipinic acid has been already described in our former communication. The reaction which takes place was found to be

$$C_{10}H_{10}O_6 + 2HI = CO_2 + 2CH_3I + C_7H_6O_4.$$

The body $C_7H_6O_4$ we called hypogallic acid.

It was also mentioned that when hydrochloric acid acts on hemipinic acid the following reaction takes place:—

$$C_{10}H_{10}O_6 + HCl = CO_2 + CH_3Cl + C_8H_8O_4.$$

The formula $C_8H_8O_4$ has been confirmed by further analyses, and from the analysis of its silver-salt we have shown it to be a monobasic acid. This acid may be called methyl-hypogallic acid, as it contains one molecule of methyl more than the hypogallic acid, and may be converted into that acid by the prolonged action of hydrochloric acid on it.

4. Whilst experimenting with hemipinic acid we found that this acid may crystallize in different forms. The crystals were found to contain different amounts of water; thus when it crystallizes from a dilute solution by spontaneous evaporation, the crystals contain half a molecule of water; when from a supersaturated solution, they contain one molecule; and lastly, when crystallized in the ordinary way by cooling a hot solution, they contain two and a half molecules.

From the experiments here, as well as those in our former paper, it appears that the following compounds derived from opianic acid will be found to exist:—

$C_{10}H_{10}O_4$ Dimethyl nor-meconin (ordinary meconin).	$C_{10}H_{10}O_5$ Dimethyl nor-opianic acid (ordinary opianic acid).	$C_{10}H_{10}O_6$ Dimethyl nor-hemipinic acid (ordinary hemipinic acid).
$C_9H_8O_4$ Methyl nor-meconin.	$C_9H_8O_5$ Methyl nor-opianic acid.	$C_9H_8O_6$ Methyl nor-hemipinic acid.
$C_8H_6O_4$ Nor-meconin.	$C_8H_6O_5$ Nor-opianic acid.	$C_8H_6O_6$ Nor-hemipinic acid.
$C_8H_8O_4$	$C_8H_8O_3$	$C_8H_8O_4$ Methyl hypogallic acid.
$C_7H_6O_2$	$C_7H_6O_3$	$C_7H_6O_4$ Hypogallic acid.

Of the above, the following have been prepared:—

1. $C_{10}H_{10}O_4$, $C_{10}H_{10}O_6$ by the action of potash on opianic acid; thus,

$$2C_{10}H_{10}O_5 = C_{10}H_{10}O_4 + C_{10}H_{10}O_6.$$

2. $C_9H_8O_4$ by the action of hydrochloric and hydriodic acids on meconin; thus,

$$C_{10}H_{10} + HI = C_9H_8O_4 + CH_3I.$$

3. $C_9H_8O_5$ by the action of hydrochloric or hydriodic acids on opianic acid; thus,

$$C_{10}H_{10}O_5 + HI = C_9H_8O_5 + CH_3I.$$

4. $C_8H_8O_4$ by the action of hydrochloric on hemipinic acid; thus,

$$C_{10}H_{30}O_6 + HCl = C_8H_8O_4 + C\,O_2 + C\,H_3Cl.$$

5. $C_7H_6O_4$ by the action of hydriodic acid on hemipinic acid; thus,

$$C_{10}H_{10}O_6 + 2\,H\,I = C_7H_6O_4 + C\,O_2 + 2\,C\,H_3I.$$

In the second part of the paper the properties and the preparation of a new base prepared from narcotine are described. When narcotine is heated for from six to eight days with strong hydrochloric acid at 100°, two molecules of chloride of methyl are given off, and the chloride of the new base formed. The reaction which takes place is

$$C_{22}H_{23}N\,O_7 + 2\,HCl = C_{20}H_{19}N\,O_7 + 2\,C\,H_3Cl.$$

This base we have called *methyl-nor-narcotine*; it forms an almost white amorphous powder insoluble in water and ether, slightly soluble in alcohol; it is easily soluble in carbonate of sodium, by which means it may be separated from narcotine. None of its salts form crystalline compounds (the chloride, sulphate, and nitrate have been made). In the paper of which this is an abstract, mention is made of two other new bases derived from narcotine; these have not as yet been described. They are the dimethyl and nor-narcotines, the first being the product of the action of hydrochloric acid for a short time on narcotine, and the latter the product of the action of strong hydriodic acid on narcotine. The reactions may be written

$$C_{22}H_{23}N\,O_7 + HCl = C_{21}H_{21}N\,O_7 + CH_3Cl$$

and

$$C_{22}H_{23}N\,O_7 + 3\,H\,I = C_{19}H_{17}N\,O_7 + 3CH_3I.$$

There exist, therefore, four narcotines:—

1. Ordinary narcotine, or trimethyl nor-narcotine, $C_{22}H_{23}N\,O_7$.
2. ,, ,, dimethyl nor-narcotine, $C_{21}H_{21}N\,O_7$.
3. ,, ,, methyl nor-narcotine, $C_{20}H_{19}N\,O_7$.
4. ,, ,, nor-narcotine, $C_{19}H_{17}N\,O_7$.

The descriptions and properties of the first-mentioned new bases will form the subject of a future communication.

VIII. "On the Chemical Intensity of Total Daylight at Kew and Pará in 1865–67." By Henry E. Roscoe, F.R.S. Received May 14, 1867.

(Abstract.)

This communication contains the results of a regular series of measurements of the chemical action of daylight, carried out at the Kew Observatory, through the kindness of Dr. Balfour Stewart, according to the method described by the author in the Philosophical Transactions for 1864, p. 605. The observations extend over a period of two years, from April 1, 1865 to March 31, 1867. The second part of the communication gives the results of observations upon the Intensity of the Chemical action of Sunlight under the Equator, made at Pará in latitude 1° 28′ S. during the month of April 1866.